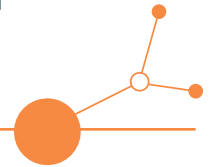


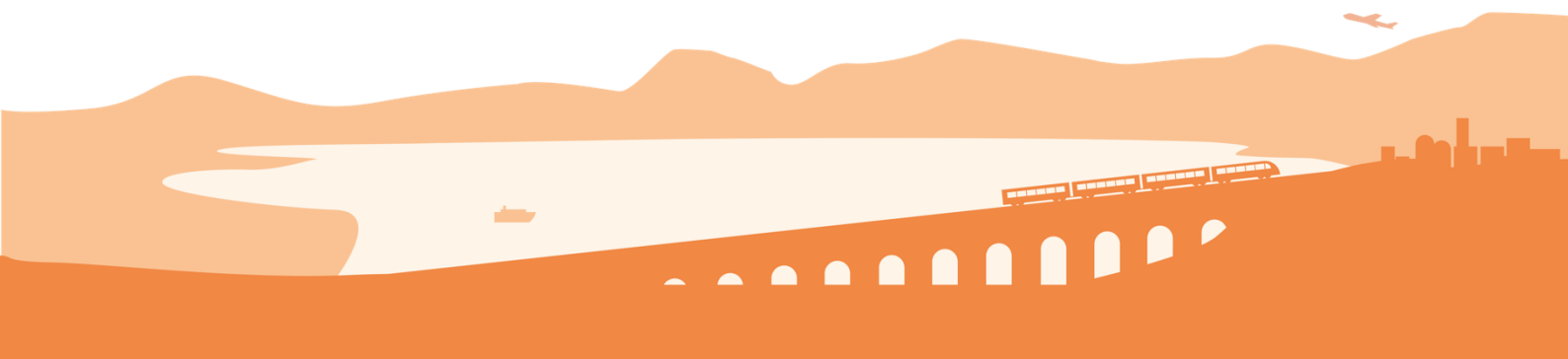
D3.2.3 Final Action plan and take up

Bologna metropolitan area



Final Version

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1. Executive summary

This document is the final Action plan for the DREAM_PACE pilot region of Bologna metropolitan area and is part of deliverable D3.2.3.

The draft Action Plan (D.3.2.1) built on the analysis and diagnosis of governance and planning (Activity 1.1) and of operational trends and approaches to DRT (Activity 2.1) and on the DRT strategy elaborated in D3.1.2 and for which the consultation process is being completed. Updating the draft Action plan presented in D3.2.1, this deliverable defines the final Action plan delivered at local /regional level, integrating final strategy and solutions. It includes the documentation on the adoption and description of the approval process by decision makers.

This document is organized as follows.

Chapter 2 provides an overview of the pilot region, outlining the purpose and scope of the Action plan.

Chapter 3 outlines the strategic background and the scenarios developed in the pilot area.

Chapter 4 describes the development of the Action plan, highlighting the needs and priorities identified, the challenges addressed, and the stakeholder involvement process. It also outlines the pilot actions and its components, specifies the measures that are consequently implemented in order to achieve the objectives of the Action plan.

Chapter 5 provides information on the monitoring and evaluation process for the Action plan, including the expected results of implementation and the estimated relevant impacts.

Chapter 6 serves as the concluding chapter, outlining how the Action plan will be officially approved or taken up, summarizing the overall approach, and presenting the next steps.

Chapter 7 provides a comprehensive list of references, offering background information and sources supporting the document.



2. Introduction

The Metropolitan City of Bologna (comprising 55 municipalities and approximately 1 million inhabitants) is located in the Emilia-Romagna region, with Bologna as its capital (around 400.000 inhabitants). The area's mobility system is structured around: a bus public transport (PT) network (36,5 million km/year and 96,5 million passengers/year in 2021) - which includes DRT services, a metropolitan rail service (5,3 million km/year, 12,6 million passengers/year in 2021), free-floating bike- and car-sharing services.

Over the past decade, several key trends have contributed to shape mobility patterns: the motorization rate increased from 62,4 cars/100 inhabitants in 2012 to 68 cars/100 inhabitants in 2022, while the population grew by 2,1%. The proportion of students rose by 8% (2016-2022), and the population has progressively aged. The percentage of people living in Bologna compared to the entire metropolitan area has remained stable (38,4%), though the number of active enterprises has decreased by 2,4%, while employment increased by 18%¹.

Main transport destinations include Bologna city centre, the main train and bus stations, the airport, and the Fair Centre, with secondary destinations such as hospitals and surrounding industries also significant.

Despite the availability of an extensive and diverse PT network and shared mobility options, several challenges persist, including:

- congestion peaks on some PT lines;
- need to guarantee night service in the outskirts;
- provide low demand area with an acceptable level of service;
- provide access to the industries in the surroundings of the main Bologna city;
- guarantee a proper number of shared transport means (especially the cars and the e-cars).

Given these socioeconomic, cultural, and territorial dynamics, the Bologna pilot action is framed within the context described above, aiming to address the specific mobility challenges and promote innovative solutions for a more integrated and sustainable transport system.

The Bologna action in DREAM_PACE is the Pilot 1.1 "GOVERNANCE AND PLANNING of INTEGRATED DRT-public transport in a MaaS logic for peripheral and low demand areas" and focuses on the following components:

- 1 - Strategic planning approach (tested within a. SUMP);
- 2 - Recommendations on data governance and integration, tariff and funding;
- 3 - DRT dedicated tendering procedure (demonstrated on field).

As regards Regulation of DRT services, currently, the rules are defined by SRM, which is the metropolitan Public Transport Authority (PTA). After receiving the related fundings, SRM can award the DRT service through a tender or involving the current operator for the PT in the metropolitan area, case by case.

In such a context, the DREAM_PACE Action plan has the purpose of setting a long-term vision for DRT integration by ensuring:

- sustainability, through alignment with funding mechanisms and regulatory frameworks;
- scalability, allowing the model to be expanded to other metropolitan and regional contexts;
- operational viability, optimizing DRT services to complement traditional PT while addressing local mobility needs.

¹ More statistics of the Bologna metropolitan area are available at <https://inumeridibolognametropolitana.it/dati-statistici>



3. Strategic background and scenarios developed in the area

Given the above picture of mobility and transport in the Bologna metropolitan area, several needs and challenges were identified at the governance and planning level. They are mainly related to the development of a planning approach and a tendering scheme for an effective integration of DRT elements in PT and in a MaaS.

The key objective of the pilot was to improve accessibility in underserved areas by integrating DRT services into the existing urban transport network.

The main needs and challenges identified in the governance and planning of DRT included²:

- aligning needs with planning to ensure that services meet the requirements of underserved areas;
- determining the most suitable operational model(s), to identify the optimal approach for delivering DRT services;
- developing effective methods to collect and integrate data, ensuring its use for ongoing monitoring and future planning;
- addressing tariff structure, to ensure sustainability and wide adoption of the service.

Through DREAM_PACE, DRT in Bologna has become an essential component of both regional and local mobility networks, enhancing accessibility, territorial cohesion, and social inclusion. In a future (and desirable) scenario, following the implementation of the DREAM_PACE pilot, DRT services will be fully integrated into public transport planning and procurement processes, with clear responsibilities and service requirements for both the main transport operator and the DRT operator.

To effectively design and implement this strategy, the Bologna Pilot established a Living Lab (LL) as a collaborative platform for analysis, planning, and co-design. The LL played a crucial role in identifying local governance and operational challenges, engaging key stakeholders, and fostering public awareness and participation.

Stakeholder engagement in the Bologna LL was structured through a Stakeholder Mapping exercise, which identified key actors based on their institutional capacity and decision-making influence. This approach ensures that the LL includes representatives with the necessary expertise and authority to drive real policy and operational changes.

The Bologna LL stakeholder group defined a strategic evaluation and planning framework that is scalable at the regional level. This process involved identifying the key characteristics of an optimal DRT service model for the metropolitan area, ensuring seamless integration with existing public transport networks and alignment with regional mobility strategies. The definition of DRT planning and governance in the Bologna LL operates on a metropolitan scale, therefore the Emilia-Romagna Region (RER) was also included among the LL stakeholders. This collaboration aimed to assess practical actions in the territory and evaluate the scalability of the co-designed solutions.

The outcome of the strategy adopted in the Bologna pilot has been the creation of an integrated and scalable governance model for DRT services, enhancing accessibility and efficiency within the metropolitan transport system.

In total, seven meetings of the Bologna Living Lab (LL) took place. The meetings - full details are available in D3.2.2 - were organized as described below, and each of them produced specific outcomes.

² Ref. D.1.1.3 “Development scenarios for DRT innovative governance and planning approaches”



The first two LL meetings were dedicated to present the DREAM_PACE project and the planned LL activities to the involved stakeholders and to initiate the development of the desired scenario for the future DRT in the metropolitan city. Particular attention was given to planning and governance aspects, while also developing a strategy to enable the integration of demand responsive transport into the Sustainable Urban Mobility Plan (SUMP) and into MaaS. Within this process, boundaries were defined to identify the conditions under which it is functional to develop a DRT scheme tailored to the Bologna context (“Scenario development”).

Following these first two LL meetings, the Bologna LL entered its operational phase and the plan of the activities for the following meetings was restructured to host also the Co-design of the pilot solutions and their validation within the pilot timeframe.

- 3rd LL Meeting (phase B - State of the art + C - Scenario development + D - Co-Design of solutions³): this meeting focused on discussing case studies and best practices to define data exchange protocols for integrating DRT services into the public transport offer and a MaaS system. Additionally, the governance structure and roles of key stakeholders were outlined.
 - Outcomes: (1) refinement and validation of the study on measure “a” (see below chapter 4.2.1) and data exchange protocols for service information and booking, ensuring DRT integration into PT and MaaS; (2) definition and validation of governance models.
- 4th LL Meeting (phase B - State of the art + C - Scenario development + D - Co-Design of solutions): the scope of this meeting was to present the study on DRT costs, focusing on its integration within the reorganization of PT services and the definition of funding models and financial sustainability strategies for DRT.
 - Outcome: refinement and validation of the study developed as a result of Bologna pilot action “c”.
- 5th LL Meeting (phase B - State of the art + C - Scenario development + D - Co-Design of solutions): this meeting presented the territorial diagnosis (mobility demand assessment and identification of low-demand areas) and introduce the concept of DRT-PT integration and collecting feedback of different DRT models for specific territories.
 - Outcome: refinement and validation of the study developed as a result of Bologna pilot action “b”.
- 6th LL Meeting (phase B - State of the art + C - Scenario development + D - Co-Design of solutions): this meeting with decision makers focused on the results related to the application of methodologies for estimating mobility demand and identifying weak-demand areas in the Metropolitan city of Bologna. The meeting included sharing and discussing the service models applicable in these identified weak-demand areas, as well as the related hypotheses on possible remuneration models for DRT services.
 - Outcome: (1) refinement and validation of the study developed as a result of Bologna pilot action “d”; (2) presentation and validation of all measures and related outputs of the Bologna LL; (3) discussion of their potential adoption by the authorities involved in the meeting (Metropolitan city of Bologna and Municipality of Bologna).
- Wrap-up LL meeting (phase F - Capitalization of pilot achievements): this final meeting of Bologna LL was organized to present the final results of the DREAM_PACE project, with a specific focus on the

³ DREAM_PACE methodology phases: A - Living Labs preparation/ stakeholder mapping; B - State of the art; C - Scenarios development; D - Co-design of solutions. See further details in D.3.1.1.

(F) Capitalization of pilot achievements represents an additional phase that was not originally identified during the early project development.



solutions developed within the Bologna LL and on the application of the related pilot measures. The meeting also introduced the DRT4All website⁴.

- Outcome: (1) presentation of the final results of the Bologna LL and on the application of the related pilot measures; (2) presentation of the DRT4all website; (3) discussion with stakeholders to reflect on possible funding opportunities to support the uptake and further implementation of the proposed solutions.

These meetings ensured a structured approach to the co-design process, refining technical, governance, and financial aspects essential for the successful implementation and long-term sustainability of DRT services. The approach ensured the validation of the activities and also helped maintain a high level of interest and engagement among stakeholders throughout the process.

Following this approach, the Bologna LL completed the following actions:

- validation of an operational and technical framework for MaaS integration, defining the data exchange protocols and functional requirements necessary to guarantee interoperability between DRT operators and the MaaS ecosystem;
- validation of a replicable methodology for demand assessment, identifying weak-demand areas and mobility needs through data-fusion techniques;
- validation of a comprehensive economic and contractual model, identifying specific cost structures and remuneration criteria (such as equivalent kilometres) to facilitate the formal inclusion of DRT services into future PT Contracts of Service;
- validation of a strategic planning approach to integrate DRT services into the metropolitan mobility framework, ensuring their inclusion in the SUMP relaunch plan and providing a solid methodology for the future SUMP 2029 planning cycle;
- consolidation of a multi-level governance and cooperation model, involving the Metropolitan city of Bologna (CMBO), the Municipality of Bologna (COBO), and the Emilia-Romagna Region (RER) to ensure that the co-designed solutions are not only locally validated but also scalable.

The Action plan of the Bologna metropolitan area is based on the implementation of the actions developed within the DREAM_PACE pilot context and validated during the LL activities. The implementation of the actions “a” to “g” beyond DREAM_PACE defines the measures for the Action plan, as defined in “D3.2.2 Report on strategy-setting workshops for Action plans’ implementation”.

⁴ DRT4All website (<https://drt4all.eu/>) is a platform developed as a online depository and dissemination channel of DREAM_PACE project.



4. Development of the Action plan

4.1. Activities developed on the territory and objective of the plan

Bologna pilot action is framed in the Pilot 1.1 “GOVERNANCE AND PLANNING of INTEGRATED DRT-public transport in a MaaS logic for peripheral and low demand areas”.

The components of the Bologna pilot define the Action plan that was being developed in the area, and structured as follows.

Component 1: Strategic planning approach for DRT in PT. This pilot component focused on testing the strategic planning approach for integrating DRT services in the relaunch of the SUMP of the Bologna metropolitan area that is scheduled for 2026, with the integration of the DREAM_PACE pilot findings into the revised SUMP document (while the future SUMP is planned for 2029). The component allows to identify opportunities and room for future implementation of DRT in terms of both integration with PT and coverage of weak-demand areas, and in the long-term perspective of the Action plan it ensures that services are effectively incorporated into long-term mobility strategies and contribute to a seamless and inclusive PT ecosystem.

Component 2: Recommendations on the integration of DRT services in MaaS. This pilot component addressed the analysis of the MaaS ecosystem that is under development at the Emilia-Romagna regional level, and the identification of the requirements for the seamless integration of DRT into the MaaS framework. In this respect, the Action plan provides detailed recommendations for including DRT in a MaaS system that serves both urban and peripheral areas in the Metropolitan city of Bologna.

Component 3: DRT dedicated tendering procedure. This pilot component aims to integrate DRT into the PT offer and to simulate a PT tendering procedure that includes DRT services, as these are currently not part of the existing Contract of Service. The objective of the Action plan is to include DRT in the next tender for the PT that is planned to be hold in the biennium 2028-2029.

As foreseen already in the pilot workplan contained in D1.3.1, SRM - with the support of the external technical expert GO-Mobility Srl - developed and tested the following actions:

- a) Study on the integration of DRT services into the public transport supply and into a MaaS system;
- b) Analysis of potential demand and definition of areas of weak demand at the metropolitan level (in terms of geographic, socio-economic, temporal, and inter-territorial characteristics);
- c) Study on DRT costs and the possibility of their inclusion in the Public Transport Contract of Service;
- d) Study on potential integrations between demand assessment methodologies and parameters and city and metropolitan planning tools (i.e., SUMP);
- e) Management of the Bologna LL stakeholder group;
- f) Exchange experiences with DREAM_PACE project partners and international experts;
- g) Identification of potential weak demand areas by analysis and geographic visualization of the O/D matrix starting from telephone SIM data;
- h) Study on the city users (non-residents) mobility demand.

Those actions are synergistic with the MIND - Mobility-Data-INSight project (funded by the "PR FESR Emilia Romagna 2021-2027" and of which SRM is a beneficiary), particularly in reconstructing mobility demand through data from mobile phone operators. Given this alignment, the MIND project's activities were bundled



in a single contract for the external support and contributed to the financing of the related specific tasks (in particular, part of pilot action “g” and pilot action “h”)⁵.

The Action plan aims to ensure that DRT governance and planning are fully aligned with the SUMP and the broader metropolitan mobility strategies. In particular:

- incorporate DRT into long-term mobility strategies and contribute to a seamless and inclusive PT ecosystem;
- include DRT in a MaaS system that serves both urban and peripheral areas in the Metropolitan city of Bologna;
- integrate DRT in the next tender for the PT (planned for the 2028-2029 biennium).

The achievement of those results through the Action plan would enable to reach some of the DREAM_PACE objectives⁶. In particular, the ones relevant for the Bologna context are recalled in the table below along with the proposed measures/actions.

Objective(s)	Measures/actions ⁷
1) Generate cost savings by integrating DRT in the existing network (efficiency) and increase quality of services in terms of territorial coverage (effectiveness)	b) Analysis of potential demand and definition of areas of weak demand at the metropolitan level. c) Study on DRT costs and the possibility of their inclusion in the Public Transport Contract of Service. g) Identification of potential weak demand areas by analysis and geographic visualization of the O/D matrix starting from telephone SIM data.
2) Identify new models for the provision of the service	a) Study on the integration of DRT services into the public transport supply and into a MaaS system. d) Study on potential integrations between demand assessment methodologies and parameters and city and metropolitan planning tools (i.e., SUMP).
3) Integrate DRT in a MaaS perspective, improving the integration of mobility services	a) Study on the integration of DRT services into the public transport supply and into a MaaS system.
4) Identify revenue model(s)	c) Study on DRT costs and the possibility of their inclusion in the Public Transport Contract of Service.

4.2. Bologna Action plan measures

The Bologna metropolitan area Action plan proposes the implementation of the actions developed during the LL activities, which fully reported in D1.2.3.

⁵ As regards in specific DREAM_PACE, the financial resources for the development of actions from “a” to part of “g” include the € 70.000 foreseen in the AF for contracting external technical expert support. Additionally, part of the WP1 staff resources from SRM is allocated to support the execution of these activities.

⁶ Ref. D.3.1.1 Annex IV

⁷ Ref. D.1.3.1, chapter 2, which already contains also the coding of the measures.



The implementation of the actions “a” to “g” beyond DREAM_PACE defines the measures for the Action plan.

4.2.1. Measure “a”: Application of the “Study on the integration of DRT services into the public transport supply and into a MaaS system”

This measure consists in the application of the operational and technical framework defined to guarantee the interoperability of DRT services with public transport and within MaaS platforms. It includes the application of the identification of data exchange protocols to facilitate service information sharing and reservation functionalities, based on a detailed outline of functional and technical requirements that ensure operational cohesion and coordination between the various actors involved. The measure focuses on the development of integration models for DRT services that can be replicated in other contexts within the MaaS4RER⁸ project, along with the provision of practical implementation guidelines to support the planning and management of DRT services embedded in a MaaS effectively.

Main facts

Timing for implementation: this measure falls under medium-term measures, with implementation planned within three years after the end of the project. The output of the LL action, i.e. the study on the integration of DRT services into the public transport supply and into a MaaS system, will be used in the next Contract of Service, scheduled for the 2028-29 biennium.

Stakeholders involved and responsibilities: given the technical nature of this study, key stakeholders include:

- PT Operator / Authority: provides operational insights, ensures alignment with existing PT services, and contributes to defining integration models that enhance service efficiency and user experience;
- IT and MaaS provider/s: validates data exchange protocols, facilitating the integration of DRT services into the MaaS platform, and ensuring interoperability with existing digital mobility services.

Risk and/or vulnerability tackled:

- technical interoperability challenges: ensuring seamless integration between DRT services, public transport systems, and MaaS platforms may require overcoming technological incompatibilities and data standardization issues;
- data governance: managing the exchange of service information and reservation data;
- regulatory and contractual complexities: aligning DRT integration within existing PT Contracts of Service and regulatory frameworks may require adjustments in procurement procedures and service agreements;
- user adoption and digital accessibility: ensuring that the integration of DRT into MaaS is user-friendly and accessible to all.

Financing plan and sources: the next Contract of Service will be prepared by SRM with the winner of the public tender for PT.

⁸ The MaaS4RER (Mobility as a Service for Emilia-Romagna Region) project is part of the national MaaS4Italy initiative. It aims to integrate various transportation services into a single digital platform, allowing users to organize, book, and pay for their journeys through a dedicated app.

MaaS4RER: <https://mobilita.regione.emilia-romagna.it/piani-programmi-progetti/maas>

MaaS4Italy: <https://innovazione.gov.it/progetti/mobility-as-a-service-for-italy/>



4.2.2. Measure “b”: Application of the “Analysis of potential demand and definition of areas of weak demand at the metropolitan level”

This measure implements in practice the replicable methodology to define, in a coherent and reasonable manner, the geographical and functional areas where local public transport services should be planned and awarded, while identifying the potential mobility demand to be met. The analysis goes beyond a simple description of observed mobility, incorporating latent needs and a deep assessment of the structural and socio-economic characteristics of the Metropolitan city of Bologna - such as its morphology, urbanization patterns, demographic profiles, and the local economic system. By considering these geographic, socio-economic, temporal, and inter-territorial factors, the measure ensures the definition of an optimal local PT network for metropolitan connections, and pinpoints specific DRT opportunities in low-demand areas, providing a robust framework for evidence-based service design.

Main facts

Timing for implementation: this measure falls under medium-term measures, with implementation planned within three years after the end of the DREAM_PACE project. It is part of the planning phase, laying the groundwork for integrating DRT into the PT network.

In the short term, the application of this analysis has already served as a data support for the drafting of the “Relazione dei lotti di affidamento” (“Report on the service awarding lots”) for the local public transport services of the Metropolitan city of Bologna⁹, which was completed by SRM in 2025.

Stakeholders involved and responsibilities: given the territorial nature of this mobility analysis, key stakeholders include:

- Public Authorities (local and regional): responsible for governance, urban and regional mobility planning, and ensuring alignment with policy frameworks (e.g., SUMP);
- PT Operator / Authority: provide operational insights, data on existing services, and contribute to the evaluation of DRT integration feasibility;
- Technical experts and data analysts: to support in demand assessment, data integration, and methodology development).

Risk and/or vulnerability tackled:

- data limitations: overcoming fragmented or incomplete mobility data;
- low predictability of demand: addressing uncertainties in mobility patterns by refining demand estimation methodologies;
- coordination challenges: ensuring effective collaboration between multiple stakeholders to align strategies and policies.

Financing plan and sources: following the exploitation already done for the preparation of the “Report on the service awarding lots”, SRM will apply the results of the Analysis when preparing the next public tender for the PT service in the Bologna metropolitan area, in particular targeting the inclusion of DRT in the next PT Contract of Service.

⁹ The Report illustrates the analysis conducted on the local public transport basin of the Metropolitan city of Bologna as required by Measure 6 of the Transport Regulation Authority (ART) Resolution n. 48/2017 and applying the criteria provided by the Resolution itself and by art. 48, paragraph 6, letter a) of DL 50/2017.



4.2.3. Measure “c”: Application of the “Analysis on DRT costs and the possibility of their inclusion in the PT Contract of Service, ensuring cost efficiency and optimized resource allocation”

This measure applies the defined cost structure of DRT services for their potential inclusion in the PT Contract of Service, ensuring cost efficiency and optimized resource allocation. The Analysis considers key DRT features - such as flexibility, dynamic routing, and demand-based service adjustments - alongside the specific operational characteristics of these services, assessing their financial sustainability within the existing PT framework. It involves developing models for equivalent kilometres and identifying criteria for a remuneration model consistent with the standard cost system to ensure fair compensation and cost allocation. Furthermore, the measure focuses on simulating economic feasibility through parametric frameworks to evaluate different operational and funding scenarios, while analysing the conditions of applicability and providing guidance - with KPIs - for the formal inclusion of DRT services in PT Contracts of Service. This approach provides a structured basis for integrating DRT into long-term PT funding and contractual mechanisms, ensuring sustainable operation and financial viability.

Main facts

Timing for implementation: this measure falls under medium-term measures, with implementation planned within three years after the end of the project. The measure will use the output of the pilot action “c” in the next PT Contract of Service, scheduled for the 2028-29 biennium.

Stakeholders involved and responsibilities: given the territorial nature of this analysis, key stakeholders include:

- Public Authorities (local and regional): responsible for governance, funding mechanisms, and contractual frameworks for PT services;
- PT Operator / Authority: providing operational insights, cost data, and contributing to the evaluation of financial sustainability;
- technical experts and data analysts: supporting the development of economic models, feasibility studies, and regulatory guidelines.

Risk and/ or vulnerability tackled:

- uncertainty in cost estimation: variability in DRT operational costs, influenced by demand fluctuations, service configurations, and geographic factors, may challenge accurate financial forecasting;
- regulatory and contractual complexities: aligning DRT integration within existing PT Contracts of Service and regulatory frameworks may require adjustments in procurement procedure, funding structures, and contractual obligations;
- financial sustainability risks: ensuring funding for DRT services is crucial. If the cost structure is not well-defined or aligned with available resources, the economic feasibility of DRT could be compromised;

Financing plan and sources: SRM will apply the results of the Analysis when preparing the next public tender for the PT service in the Bologna metropolitan area, in particular targeting the inclusion of DRT in the next PT Contract of Service.



4.2.4. Measure “d”: Application of the “Study on potential integrations between demand assessment methodologies and parameters and city and metropolitan planning tools (i.e., SUMP)”

This measure implements the results that inform and enhance the PT strategic planning process, by exploring the integrations between advanced mobility demand analysis methods and strategic planning tools, such as the SUMP of the Bologna metropolitan area. In particular, it investigates how the results obtained through a multi-level demand estimation approach (based on the data-fusion techniques detailed in the pilot action “b - Analysis of potential demand and definition of areas of weak demand at the metropolitan level”) can effectively support the planning and restructuring of PT services, especially in low-demand areas. These results include the development of guidelines for evolving the suburban local PT network and defining the role and characteristics of mobility hubs, with a specific focus on the deployment of DRT services. For example, within the framework of the future SUMP (or the relaunch plan of the current one), this approach allows for the identification of primary interchange points and the precise definition of their features and required infrastructure based on the types of lines and users utilizing them.

Main facts

Timing for implementation: this measure falls under short-term measure, with implementation planned within the end of the project. The output of the pilot action “d” has been used since the end of 2025 as operational basis for the SUMP relaunch plan scheduled for 2026, thus ensuring that the project's strategic findings are fully integrated into the revised metropolitan planning document.

Stakeholders involved and responsibilities: given that this study covers the entire metropolitan territory, it is essential to involve all relevant territorial stakeholders:

- Public Authorities (local and regional): responsible for integrating demand assessment methodologies into urban and regional planning tools, ensuring alignment with mobility policies (e.g., SUMP and Metropolitan Basin Plan).
- PT Operator / Authority: provides operational data, insights on existing services, and contributes to defining the role of DRT within the broader PT network;
- University: supports the validation of the study by offering research-based insights to enhance the governance and planning of DRT services;
- general public: ensure planning solutions reflect actual mobility needs.

Risk and/or vulnerability tackled:

- misalignment between planning tools: integrating demand assessment methodologies with different territorial planning instruments may require adjustments to existing frameworks;
- stakeholder coordination challenges: aligning the perspectives and priorities of multiple actors may slow down decision-making processes;
- uncertainty in future mobility patterns: evolving mobility trends could affect the accuracy of demand models.

Financing plan and sources: SRM is already applying the results of the Study for supporting CMBO in the SUMP relaunch plan.



4.2.5. Measure “g”: Application of the “Identification of potential weak demand areas by analysis and geographic visualization of the O/D matrix starting from telephone SIM data”

This action defines the quantitative structure of demand with as much detail as possible considering spatial, temporal and user category (resident, non-resident, foreign, etc.) features.

The O/D matrix was generated using mobile phone data acquired from Vodafone Business. The reference periods for the analysis were May, July, and November 2024, while the geographical references included approximately 140 areas within the Metropolitan city of Bologna and around 60 areas outside the Metropolitan city of Bologna. The data underwent processing, cleaning, and classification. To manage complexity and enhance usability, the geographic representation of the data was implemented through an interactive Tableau dashboard, enabling detailed visualization and analysis of weak demand areas.

The O/D matrices produced by Vodafone Business are based on data representing approximately 27% of the mobile network market share. The stratification of the sample is a key element in the data expansion processes used to extrapolate results to the full population dataset delivered to the final client. Additionally, Vodafone Business collaborates with ISTAT to improve statistical methodologies and data expansion techniques, ensuring greater accuracy and representativeness.

Main facts

Dependencies (if any) on other proposed measures/actions: the methodology for identifying potential weak demand areas is described in the section 4.2.2 related to Action b).

Timing for implementation: this measure falls under short-term measures, with implementation planned within the end of the project. The output of the pilot action “g”, an interactive dashboard which visualizes the O/D matrix, can be used immediately to support decision-making in public transport planning, particularly in the design of new mobility services.

Stakeholders involved and responsibilities: the functionalities of the interactive dashboard, including filtering capabilities and its effectiveness in identifying weak demand areas and associated mobility patterns, are internally tested and validated by SRM. The Metropolitan city of Bologna (CMBO) is the only stakeholder/associated partner involved in this phase related to the validation of the zoning used in the dashboard.

Risk and/or vulnerability tackled:

- data accuracy and representativeness: the use of telephone SIM data for mobility analysis depends on data quality, potential biases, and coverage limitations;
- methodological consistency: ensuring alignment between this action and the broader demand assessment methodology (action “b”) is crucial for reliable and replicable results;
- usability of the dashboard: the effectiveness of the dashboard depends on the clarity of the visualization tools and the ability of stakeholders to interpret and apply the insights effectively.

Financing plan and sources: SRM uses the O/D matrix to support decision-making in public transport planning, particularly in the design of new mobility services; no more funds are needed.



5. Monitoring and evaluation

Expected results of the Action plan implementation:

- 1) optimization of public transport resources by enhancing service adaptability in low-demand areas, improving territorial coverage while maintaining cost efficiency. This will lead to better accessibility for underserved areas, a more balanced allocation of financial and operational resources, and an overall increase in service effectiveness. This optimization can be supported by the integration of DRT into strategic planning tools (i.e. the SUMP), ensuring that flexible services are fully aligned with the long-term metropolitan planning;
- 2) comprehensive evaluation of innovative DRT service provision models, assessing their feasibility within the existing public transport network and MaaS framework. The action will support the definition of optimal operational models tailored to the Bologna metropolitan area;
- 3) definition of data exchange protocols and integration models to enable the seamless incorporation of DRT services within the regional MaaS ecosystem. The development of guidelines will provide an approach for integrating DRT into MaaS platforms and the active engagement with stakeholders and IT service providers will facilitate the creation of effective digital solutions. This integration enhances interoperability between operators, improves user experience, and optimizes operational management;
- 4) identification of sustainable revenue models for DRT services through the evaluation of funding opportunities and financial sustainability. Defining key financial and regulatory aspects in the simulated tendering process will support the long-term viability of DRT. By fully integrating DRT into PT tendering procedures, the framework ensures that services are delivered within an institutional system, guaranteeing fair and sustainable pricing for users.

Despite the promising potential of the proposed actions, there are several risks that may arise during the planning and implementation phases. These risks need to be carefully managed to ensure the successful delivery of the project and its long-term sustainability.

The **risk associated to planning and implementation** are listed as follows.

Planning and demand-related risks:

- uncertainty in demand estimation: the success of integrating DRT into the existing network depends on accurately assessing mobility demand;
- mismatch between service design and user needs: if DRT services do not align with actual mobility demand, it may fail to attract sufficient users;
- challenges in defining service parameters: establishing frequency, operating areas, and service hours for DRT while ensuring cost efficiency and reliability can be complex.

Regulatory risks:

- regulatory and contractual barriers: the inclusion of DRT within the PT system requires adjustments in procurement procedures and service contracts;
- inconsistent policy frameworks: misalignment policies regarding DRT governance, funding, and service contracts could create obstacles;
- legal uncertainties in data sharing: integrating DRT into MaaS requires data exchange across different platforms.

Financial and economic risks:



- **financial sustainability:** if financial support mechanisms are not clearly defined, the viability of the service may be at risk.

Stakeholders and users' risks:

- **stakeholder coordination challenges:** effective integration of DRT requires close collaboration between public authorities, TPO, and MaaS providers;
- **limited local authority capacity:** Public Authorities may lack the expertise or resources to manage DRT planning and governance effectively;
- **perceived complexity of the service:** if DRT booking, ticketing, or service use is not intuitive, potential users may be discouraged;
- **equity and accessibility concerns:** if not properly designed, DRT services may exclude certain user groups.

Technological and operations risks:

- **technological and operational integration:** ensuring interoperability between DRT and the existing PT network, presents technical challenges that may require additional investments and adjustments;
- **scalability challenges:** the initial pilot may function well in a controlled environment, but expanding the service to a regional scale may introduce operational complexities.

Estimated relevant impacts:

- **connectivity and accessibility:** the integration of DRT services into the PT network is able to enhance overall connectivity, especially in underserved or low-demand areas. By providing flexible, on-demand transport options, DRT can increase mobility for individuals who currently face difficulties accessing PT, such as elderly people and residents of remote areas. This can contribute to a more inclusive transportation system, ensuring that all members of society have equal access to mobility services;
- **environmental benefits:** the shift toward DRT services can contribute to the reduction of traffic congestion and pollution by optimizing resource use and reducing the number of private cars on the road. By providing efficient DRT options that reduce the need for personal vehicle ownership, the initiative can support greener, more sustainable transport systems. It is noted that, to maximize the impact of integrating DRT with PT and potentially MaaS, raising awareness and education as a planned soft measure is crucial for encouraging private car users to shift to DRT services;
- **energy savings:** DRT services can lead to energy savings by optimizing routes and service frequencies based on real-time demand. This efficient operation can reduce unnecessary travel, helping to lower energy consumption compared to traditional fixed-route services;
- **CO₂ emission reduction:** by encouraging shared rides and reducing the need for private car usage, DRT services have the potential to significantly lower CO₂ emissions. Through careful planning, the integration of DRT into the public transport network can be a key step in achieving substantial emissions reductions in the PT sector.

Possible KPIs are the followings¹⁰:

- level of data sharing;
- level of service integration;
- cost of the service;

¹⁰ Those KPIs are derived from the possible indicators listed in D.3.1.1 Annex IV.



- DRT territorial coverage, passengers on peripheral lines;
- length of DRT network/number of bus stops;
- n° of passengers;
- n° of km driven;
- hours of availability of the service.

The final identification of the KPIs can be done during the Action plan implementation, based on the actual local conditions and needs.



6. Conclusions and next steps

The contents of the Action plan for the Bologna pilot were officially approved during the LL meetings with the stakeholders, as detailed in chapter 4.

This process ensured the validation of all actions while also maintaining a high level of engagement and interest among stakeholders throughout the process.

The goal of this Action plan is to establish a scalable and sustainable framework to enhance accessibility in peripheral and low-demand areas by integrating DRT services with traditional PT and with a MaaS logic.

Building on the insights gained from the Bologna pilot, the Action plan provides strategic guidelines for:

- optimizing service provision by identifying the most suitable areas and operational models for DRT deployment;
- strengthening governance and planning to ensure DRT services are effectively coordinated within the broader transport system;
- fostering collaboration among stakeholders, ensuring continuous dialogue and co-design between public authorities, operators, and end-users.

To transform these guidelines into structural change, the Bologna Action Plan ensures that DRT governance and planning are fully aligned with the SUMP and the broader metropolitan mobility strategies. In this perspective, SRM intends to fully embed the DREAM_PACE project results into its future planning, tendering, and strategic decision-making processes, working in close cooperation with the Metropolitan City of Bologna (CMBO) and the Municipality of Bologna (COBO).

By integrating DRT into a broader transport vision, this Action plan sets the foundation for a more inclusive, efficient, and adaptable mobility system in the Bologna metropolitan area, with the potential for replication and expansion at the regional level.

The collaboration with stakeholders, which was fundamental to the successful achievement of the results, will not end with the conclusion of the DREAM_PACE project, as the long-term objective is to fully integrate DRT into the regional mobility system. To achieve this goal, it will be essential to maintain continuous dialogue with key actors, particularly Local and Regional Public Authorities, the future Public Transport Operator, and other relevant stakeholders.

SRM will continue working closely with CMBO and COBO to ensure that DRT governance and planning align with the SUMP and the broader mobility strategies of the Bologna metropolitan area. As formally stated in the Letters of Intent attached to this deliverable, CMBO and COBO have expressed their clear intention to take the DREAM_PACE project results into account in the development and update of mobility planning instruments, as well as in the evaluation and selection of local mobility measures, including those related to PT planning and sustainable mobility strategies.

This collaboration will be crucial for implementing the measures and actions developed within the project, facilitating the effective integration of DRT into the PT network and its incorporation within a MaaS framework.

In this perspective, coordination with the Emilia-Romagna Region (RER) is essential, both in view of the potential scalability of the DREAM_PACE approach and with regard to the regional MaaS system currently under development, where DRT services are expected to be fully integrated to ensure a seamless and intermodal mobility ecosystem at the regional level. The collaboration with RER can also facilitate the adoption of the solutions developed in Bologna at the regional level, serving as a strategic reference for other Public Transport Agencies that operate in roles similar to SRM. Such coordination ensures that



frameworks and tools are applied consistently across multiple territories, promoting a systematic approach to integrating DRT into regional mobility planning.

Additionally, engagement with the current and the future PTO/s - selected through the upcoming tender procedure - will be crucial to ensuring that DRT services are effectively included in the new Contract of Service, building on the outcome of the aforementioned measures.

At the same time, maintaining collaboration with IT and MaaS providers will be essential, given the continuous evolution of digital mobility solutions. In particular, ongoing work on data exchange protocols between the DRT operator and the MaaS system will be a priority to ensure the effective integration and interoperability.



7. References

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- 13) DREAM_PACE D3.1.3 “Topic guide DRT 3.0 in Sustainable Urban Mobility Plans (SUMP)”. 2026.
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